Chapter C8: Force and Energy Practice

Physics I

College of the Atlantic

1. You want a spring that is capable of launching a full Nalgene bottle around 1 meter into the air if the spring is compressed by 5 cm. What must the spring constant be for such a spring?

2. Consider two displacement vectors: $\vec{v_1} = [3m, -4m]$ and $\vec{v_2} = [2m, -2m]$. Calculate $\vec{v_1} \cdot \vec{v_2}$. Calculate the angle between $\vec{v_1}$ and $\vec{v_2}$.

3. A 0.5 kg TAB mug is traveling due north at 10 m/s.

   (a) The object is briefly acted upon by a force of 2 Newtons due east.
   (b) The object is briefly acted upon by a force of 2 Newtons due south.
   (c) The object is briefly acted upon by a force of 2 Newtons 37 degrees west of north.

   In each instance, the force acts on the mug for 1 second. For each force:

   (a) What is the impulse delivered to the mug?
   (b) What is the magnitude of the impulse delivered to the mug?
   (c) What is the k-work given to the mug? I.e., what is its change in kinetic energy?

4. A 1000 kg car rolls down a 37 degree incline at a constant speed of 20 m/s.

   (a) In one second, what energy transfer does the gravitational interaction give to the car?
   (b) Where does this energy transfer go?
   (c) What is the change in the gravitational potential energy of the cart in one second?

5. A car goes over the crest of a hill at 20 m/s. The car then coasts to the bottom of the hill, 50 meters below. Ignoring friction, what is the car's speed at the bottom?